GRAZING MANAGEMENT STRATEGIES TO CONTROL WEEDS

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INTRODUCTION

Large herbivores influence their environments in many ways. Selective grazing alters the vigor and competitive abilities of plant species and can change vegetative composition and structure. Trampling alters soil characteristics. Dunging and urination influences nutrient cycling. Animals can enhance distribution of plants by carrying seeds in their feces.

Each of these "primary" animal impacts can result in deterioration of plant communities and may have detrimental impacts on vegetation diversity and sustained productivity of rangelands. However, these same primary animal impacts can be exploited by managers to facilitate desirable and positive ecosystem processes leading to ecologically stable and diverse communities. For example, selective grazing by livestock has been used to control poisonous plants (Sharrow and Mosher 1982), improve the quality of winter forage for elk (Anderson and Scherzinger 1975), increase available browse for wintering deer and elk (Urness 1990), and promote establishment of conifer plantations (Krueger 1985, Doescher et al. 1987).

Researchers at Oregon State University have embarked on a series of studies broadly defined as "facilitative grazing management" in which primary animal impacts are used as tools to promote rangeland improvement. This paper describes preliminary results of a study in which grazing was examined as a method to help control whitetop (Cardaria draba (L.) Desv.).

THE PROBLEM

Whitetop is a creeping perennial introduced from Eurasia during the 1800's. A single plant can produce as many as 4,800 seeds, of which over 80 percent are viable (Selleck 1965). One plant growing in the absence of competition can spread over an area of 10 feet in diameter and produce 455 shoots the first year of establishment (Mulligan and Findlay 1974). Whitetop currently infests thousands of acres in eastern Oregon and is capable of replacing desirable forage species (Larson et al. 1990).

Conventional control of whitetop consists of applying 2 lb/acre of 2,4-D at early bloom. However, the effectiveness of this treatment is variable because herbicide often does not penetrate the dense canopy. Furthermore, the phenology of individual stems may not be uniform at any given calendar date, so when some stems have reached the early bloom stage, others have achieved a growth stage less affected by herbicide.

Applying herbicide to plants on any given day may affect stems that have reached early bloom, but may not be as effective on others.

The objective of our study was to manipulate height and phenology of whitetop regrowth with livestock to make it more susceptible to subsequent application of herbicide. Whitetop is not a highly palatable species, but observations suggest sheep will consume it early in the year. In this study, we wanted to learn what impacts grazing would have on height, phenology, and reproductive effort of whitetop. Therefore, we simulated grazing using a gas-powered string clipper to defoliate plants at ground level (100 percent utilization) during three phenological stages: bolting (April 29), early flowering (May 14), and full flowering (May 26). The study was conducted on a whitetop-infested field near Keating, Oregon, and study plots were 10 X 40 ft in size. We allowed regrowth to occur following defoliation, and recorded the following measurements of whitetop plants at the end of the growing season (August): (1) above-ground biomass; (2) maximum height; (3) number of vegetative and reproductive stems; (4) number of seeds produced; and (5) percent germination of seeds.

RESEARCH RESULTS

Plants defoliated early in the year will regrow if soil moisture is sufficient. Regrowth of clipped whitetop plants was not as tall, produced less above-ground biomass, fewer reproductive and vegetative stems, fewer seeds, and seeds lower in viability than untreated plants. Phenology of regrowth was more uniform at any given date than that of the control. Plants clipped during later phenologic stages were less tall and produced fewer seeds with lower seed viability than plants defoliated earlier in the season.

ABOVE-GROUND BIOMASS: Untreated plots (control) produced 2,865 lbs/acre of whitetop (dry matter), and 695 lbs/acre of associated vegetation (mostly annual species). Average biomass on defoliated plots was 385 lbs/acre of whitetop, and 1,173 lbs/acre of associated vegetation. There were no significant differences in biomass production of whitetop or associated vegetation resulting from timing of defoliation.

MAXIMUM HEIGHT: Whitetop plants growing in the control plots averaged about 17 inches in height. Height of plants clipped during the bolting and early bloom stage averaged about 7 inches. Height of whitetop plants clipped at full bloom was about 3 inches.

NUMBER OF STEMS: Since whitetop sprouts from underground shoots, we expected a large increase in the production of shoots from defoliated plants. However, there was no significant difference in total stem density among treatments, which averaged about 429 stems per square yard. The later the date of defoliation, the fewer reproductive stems were produced. Observed numbers of stems with seedheads (stems per square yard) were: control (426); defoliation at bolting (7); defoliation during early flowering (1); and defoliation during full flowering (0).

SEED PRODUCTION: Seed production on control plots averaged 491 seeds per stem and more than 200,000 seeds per square yard. Regrowth of plants clipped while bolting averaged 137 seeds per stem and about 1,000 seeds per square yard. Seed production of regrowth from plants defoliated during early flowering was 112 seeds per stem and about 112 seeds per square yard. We found no seeds produced from regrowth of plants clipped at full flowering.

SEED GERMINATION: Fifty whitetop seeds collected from each treatment plot were germinated in a growth chamber at constant temperature and moisture. After 20 days, total percent germination for each treatment was: control (83 percent); defoliation at bolting (63 percent); and defoliation at early flowering (23 percent). No seeds were produced from regrowth of plants clipped during full flowering.

APPLICATION OF RESULTS

While defoliation alone is not expected to be an effective long-term control of whitetop, we believe properly-timed grazing or mowing can be used in combination with other methods to help control this weed. In our study, regrowth of defoliated plants was not as tall and more uniform phenologically than nondefoliated plants and should be more susceptible to subsequent herbicide applications. Properly timed defoliation can stress plants physiologically, and render them less vigorous. Therefore, regrowth of defoliated plants should be less resistant to herbicides. Pre-conditioning weeds by defoliation may require lower rates of herbicides to accomplish effective control. This would be a desirable environmental goal and should lower the cost of herbicide applications. Regrowth of defoliated whitetop plants produced fewer seeds than nondefoliated plants. Although this weed spreads from below-ground shoots of established plants, it is distributed to new areas by seeds. Any reduction in this potential would be beneficial.

The concept of facilitative grazing management as explained above must include concern for the profitability of utilizing animals to accomplish environmental goals. Studies should focus not only on environmental impacts of defoliation, but also on nutritive content and anti-quality components of target plant species as sources of animal feed. Further, palatability trials are needed to determine the best species of animal and timing of use to accomplish the desired environmental objective. The future of livestock production on rangelands not only will be the continued conversion of plant material to useful products for humans, but will include the thoughtful application of primary animal impacts to help solve ecological problems.

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